

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte  
DIAN-HAU CHEN, CHIANG-JEN PENG,  
and WEI-KAY CHIU

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Appeal No. 2001-2146  
Application No. 09/270,588

**ON BRIEF**

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Before PAK, LIEBERMAN and MOORE, Administrative Patent Judges.  
LIEBERMAN, Administrative Patent Judge.

**DECISION ON APPEAL**

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner refusing to allow claims 1 through 6, 8 and 11 through 13 and claims 7, 9, 10, 14 through 30 and 33 through 36 as amended subsequent to the final rejection, which are all the claims pending in this application.

## **THE INVENTION**

The invention is directed to a method for stripping a patterned photoresist layer. The multi-step process is one comprising providing a substrate, forming a target layer over the substrate and forming a patterned positive photoresist layer on the target layer. The patterned photoresist layer acts as a mask for processing of the target layer. Following processing, one obtains a processed target layer and a processed patterned positive photoresist layer. The processed patterned positive photoresist is thereafter photo-exposed and stripped while employing a solvent. Additional limitations are described in the following illustrative claim.

## **THE CLAIM**

Claim 1 is illustrative of appellants' invention and is reproduced below.

1. A method for stripping a patterned photoresist layer comprising:

providing a substrate;

forming over the substrate a target layer;

forming upon the target layer a patterned positive photoresist layer;

processing the target layer while employing the patterned positive photoresist layer as a mask layer to thus form from the target layer a processed target layer and to form from the patterned positive photoresist layer a processed patterned positive photoresist layer;

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photoexposing the processed patterned positive photoresist layer to form a photoexposed processed patterned positive photoresist layer with enhanced solubility of the photoexposed processed patterned positive photoresist layer within a solvent; and

stripping from the processed target layer the photoexposed processed patterned positive photoresist layer while employing the solvent.

### **THE REFERENCES OF RECORD**

As evidence of obviousness, the examiner relies upon the following references:

Wright et al. (Wright)	3,664,899	May 23, 1972
Liao et al. (Liao)	4,645,562	Feb. 24, 1987
Miyashita et al. (Miyashita)	5,380,608	Jan. 10, 1995
Sato et al. (Sato)	5,994,007	Nov. 30, 1999

### **THE REJECTIONS**

Claims 1 through 7, 9 through 14, 16 through 26, 28 through 30 and 33 through 36 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Liao in view of Wright and Miyashita.<sup>1</sup>

Claims 8, 15 and 27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Lao in view of Wright and Machete and further in view of Sat.

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<sup>1</sup>Claims 31 and 32 have been cancelled.

## OPINION

We have carefully considered all of the arguments advanced by the appellants and the examiner and agree with the appellants that the rejections of the claims under §103(a) are not well founded. Accordingly, we reverse these rejections.

### The Rejections under § 103(a)

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." See *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). The examiner relies upon two separate rejections encompassing at least three references to reject the claimed subject matter and establish a *prima facie* case of obviousness.

It is the examiner's position that Liao does not teach photoexposing the processed pattern mask, Answer page 3, and neither Liao nor Wright teaches stripping a photoresist layer with a solvent. See Answer page 4. Moreover the examiner states that, "[i]n a photoresist patterning method, Miyashita teach that oxygen plasma and solvent stripping are equivalents. Hence, a person of ordinary skill in the art, at the time of the invention, would have found it obvious to strip the photoresist with a solvent because substitution of one equivalent for the other would have been expected to produce an expected result." *Id.* We disagree with the examiner's analysis.

We agree with the examiner's positive findings in Liao, Answer, page 3. We further find however that Liao discloses solvent stripping. See column 5, lines 34 -48 and column 6, lines 30-33. Wright in contrast, is directed to "[A] solvent free method for removing thin organic polymeric film from a substrate." See Abstract. Wright teaches that organic polymeric film serves as a resist and allows for etching an exposed surface in a patterned manner. See column 1, lines 17-20. "Upon completion of the etching step, it is sometimes desirable to remove the organic polymeric resist from the remaining substrate surface." See column 1, lines 20-22. Wright in a discussion of the prior art further discloses that removal of the organic polymer was accomplished by a solvent which dissolves the soluble organic polymeric film. See column 1, lines 29-31. However, "the removal of the insoluble photoresist either positive or negative from the remaining substrate was often difficult. The remaining resist was often insoluble in most organic solvents. Removal of the resist was generally effected after extended soaking combined with mechanical attrition or burning." See column 1, lines 32-38. We find that the improvement disclosed in Wright is that UV light can be utilized to effect the removal of positive photoresists. See column 1, lines 55-73 and column 3, lines 20-26. This overcomes the prior art difficulties of removing organic solvent insoluble films from substrates. See column 1, lines 66-69. We accordingly, conclude that Wright teaches away from the utilization of solvents.

Nonetheless, the examiner further relies upon a further teaching in Miyashita that an incineration treatment using oxygen plasma may be replaced by solvent removal. See column 2, lines 64-66, column 7, line 67 to column 8, line 4 and column 12, lines 10-16. This teaching of equivalency is utilized by the examiner to establish that solvent stripping and oxygen plasma can both be used to strip a photoresist. Accordingly, the position of the examiner is that the combination of references teach stripping a photoresist by combining the photoresist of Liao with the UV treatment of Wright and the alternative oxygen plasma and solvent treatment of Miyashita.

We find, however, that inadequate motivation has been presented by the examiner in order to combine the references of record. As we found supra, Wright discloses the utilization of a UV treatment in the absence of a solvent. Accordingly, no reason is seen for utilizing the solvent of Miyashita. Furthermore Miyashita utilizes an oxygen plasma incineration of the remaining resist or the utilization of a solvent treatment. The suggestion does not come within the purview of combining two or more materials where each is taught by the prior art to be useful for the same purpose. In re Kerkhoven 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980). In our view, Miyashita teaches two alternative processes, one directed to solvent stripping, wherein each process is independent of the other. Furthermore, as we stated supra, Wright expressly teaches away from the utilization of a process wherein solvent is utilized to dissolve a photoresist.

Based upon the above findings and analysis, the decision of the examiner is reversed. Furthermore, with respect to the rejection further relying upon Sato, that reference is relied upon solely for its disclosure of a diazo compound as a photo active agent. Accordingly, it fails to cure the deficiency of the other references and that rejection is likewise reversed.

#### REMAND TO THE EXAMINER

On consideration of the record we remand the application to the jurisdiction of the examiner for appropriate action in accordance with our findings *infra*. Upon return of this application to the examiner, the examiner should reconsider the patentability of the claimed subject matter, with respect to at least claim 1 over the individual reference to Liao alone.

An analysis of claim 1, with respect to each of the limitations disclosed by Liao appears to support the position that a *prima facie* case of obviousness may be established by Liao. The issue to be considered is whether Liao teaches and suggests each of the limitations required by the subject matter of claim 1.

We find that Liao is directed to a double layer photoresist of two different photoresist materials. See column 2, line 7. Liao provides for a seven step process wherein a double layer photoresist coating is placed on a wafer. See column 6, lines 1-14. One layer of the photoresist is a polymethyl methacrylate. *Id.* The substrate layer 100 is covered with an oxide layer 105, which in turn is covered by a polymethyl methacrylate positive photoresist

layer, 110 and a Kodak 820 positive resist layer 115. See Figure 2B. The examiner should consider whether the first photoresist layer 110 functions as a target layer within the meaning of the claimed subject matter, as Figure 2C and column 6, lines 10-18 requires processing the second photoresist layer, leaving the first photoresist layer, the target underneath (PMMA) intact and initially utilizing only the second photoresist layer (115) as a mask layer.

Furthermore, a second UV treatment is utilized to treat and develop the 110 target layer. See column 4, lines 16-35. As a result it appears that whatever remains of the processed patterned positive resist layer 115 has been photo exposed as required by the claimed subject matter. The examiner should determine as if the second exposure of layer 115, meets the requirements of “photo exposing the processed patterned photoresist layer”, as required by claim 1. See column 6, lines 19-23.

We further find that subsequent to an isotropic plasma etch, the photoresist is stripped with a solvent by immersion in acetone. See column 6, lines 29-34 and column 5, lines 34-44. Accordingly there is a disclosure of stripping the photoresist target layer utilizing both a UV treatment and a solvent treatment of at least the photo exposed processed patterned photoresist layer as required by claim 1.

#### **APPROPRIATE ACTION**

We remand this application to the examiner for action consistent with the above.



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As a final point, we emphasize that we have considered the merits of the examiner's rejection to the extent of the record before us.

The examiner must consider whether there is basis in Liao for each of the limitations in the claimed subject matter.

This application, by virtue of its "special" status requires an immediate action. MPEP § 708.01 (8th ed., Aug. 2001). It is important that the Board be informed promptly of any action affecting the appeal in this case (e.g., abandonment, issue, reopening prosecution).

### **DECISION**

The rejection of claims 1 through 7, 9 through 14, 16 through 26 and 28 through 36 under 35 U.S.C. §103(a) as being unpatentable over Liao in view of Wright and Miyashita is reversed.

The rejection of claims 8, 15 and 27 under 35 U.S.C. §103(a) as being unpatentable over as being unpatentable over Liao in view of Wright and Miyashita and further in view of Sato is reversed.

The decision of the examiner is reversed.

**REVERSED AND REMANDED**

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PAUL LIEBERMAN  
Administrative Patent Judge

JAMES T. MOORE  
Administrative Patent Judge

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PAK, Administrative Patent Judge, concurring-in-part and dissenting-in-part.

Although I share the majority's view that the claimed subject matter would not have been obvious to one of ordinary skill in the art in view of the applied prior art references, I do not see any reason to remand this case to the examiner. I write separately to clarify my reasons for concurrence and to state my reasons for dissent.

As pointed out by the examiner and the appellants, the claims on appeal are rejected as follows:

- 1) Claims 1 through 7, 9 through 14, 16 through 26, 28 through 30 and 33 through 36 under 35 U.S.C. 103 as unpatentable over Liao in view of Wright and Miyashita; and
- 2) Claims 8, 15 and 27 under 35 U.S.C. 103 as unpatentable over Liao in view of Wright, Miyashita and Sato.

The majority seems to indicate that Liao teaches every feature recited in claim 1, except that they are unsure whether “the second exposure of layer 115, figure 2E[,] meets the requirements of ‘photo exposing [sic, photoexposing] the process patterned photoresist layer’ as required by claim 1.” See the decision, pages 5, 7 and 8 . I find that the so-called “the second exposure of layer 115” referred by the majority is a conventional anisotropic plasma etching procedure, not the claimed photoexposing step. See Liao, column 3, line 40 to column 5, line 34. To the extent that the majority relies on the deep UV exposure step referred to at column 6 of Liao, I find that it does not involve photoexposing the **processed patterned positive photoresist** layer from the claimed earlier processing and patterning steps as required by claim 1. As such, there is no reason to remand this application to the examiner to reconsider the content of Liao which has been already considered by the examiner.

Indeed, recognizing this deficiency in Liao, the examiner relies on the disclosure of Wright. As correctly determined by the majority, however, there simply is no suggestion or motivation to employ the solvent free photoexposing method described in Wright in the solvent employing process of Liao. Even if the teachings in Wright and Liao are properly combinable as suggested by the examiner, such a combination would have led one of ordinary skill in the art away from the claimed invention. Specifically, the solvent-free method proposed by Wright would have taught away one of ordinary skill art from the following claimed steps:

photoexposing the processed patterned positive photoresist layer to form a photoexposed processed patterned positive layer with enhanced solubility of the photoexposed processed patterned positive photoresist layer within a solvent; and

stripping from the processed target layer the photoexposed processed patterned positive photoresist layer while deploying the solvent.

Since neither Miyashita nor Sato is relied on to show the above missing feature, I concur with the majority's view regarding reversal of the examiner's § 103 rejections. However, I do not approve of and dissociate myself from the majority's remand order for the reasons indicated *supra*, for it wastes the PTO's critical resources in unproductive exercises.

CHUNG K. PAK	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES

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